**CLASS-XI**

**39. PHYSICS**

**Time: 3 Hrs**

**Theory: 70Marks**
**Practical: 20 Marks**
**C.C.E.: 10 Marks**
**Total: 100 Marks**

**STRUCTURE OF QUESTION PAPER (THEORY)**

1. There will be one theory paper comprising of 26 questions.
2. Question no. 1 to 8 will be of one mark each.
3. Question no.9 to 16 will be of two marks each.
4. Question no. 17 to 23 will be of four marks each. There will be internal choice in any two questions.
5. Question no. 24 to 26 will be of six marks each. There will be100% internal choice in them.
6. Distribution of marks over different dimensions of the paper will be as follows:

| LEARNING OUTCOMES | MARKS | PERCENTAGE OF MARKS |
|---|---|---|
| KNOWLEDGE | 26 | 36% |
| UNDERSTANDING | 30 | 44% |
| APPLICATION | 14 | 20% |
| **Total** | **70** | **100%** |

7. In the category of one (1) mark question there will be four (4) questions of the objective type such as Yes/No, tick/cross, fill in the blanks, multiple choice, true/false etc.
8. Use of un-programmable calculator is allowed. The log tables can be used.
9. Total weightage of numerical will be 20% i.e 14 marks. There will be three numerical of 2 marks each & 2 numericals of 4 marks each.

**UNIT WISE DISTRIBUTION OF MARKS**

| UNIT | TITLE | MARKS |
|---|---|---|
| UNIT-I | Physical world and measurement | 05 |
| UNIT-II | Kinematics | 07 |
| UNIT-III | Laws of motion | 07 |
| UNIT-IV | Work, Energy & Power | 07 |
| UNIT-V | Motion of System of Particles & Rigid body | 09 |
| UNIT-VI | Gravitation | 06 |
| UNIT-VII | Properties of Bulk matter | 12 |
| UNIT-VIII | Thermodynamics | 05 |
| UNIT-IX | Behaviour of perfect gas and kinetic theory of gases | 05 |
| UNIT-X | Oscillation & waves | 07 |
| **Total Marks** | | **70** |

## SCHEMATIC DISTRIBUTION OF MARKS

| UNIT | TITLE | 1 MARK QUESTION | 2 MARKS QUESTION | 4 MARKS QUESTION | 6 MARKS QUESTION | TOTAL MARKS |
|---|---|---|---|---|---|---|
| 1 | Physical world & measurement | 1 | 2 | - | - | 05 |
| 2 | Kinematics | 1 | 1 | 1 | - | 07 |
| 3 | Laws of motion | 1 | 1 | 1 | - | 07 |
| 4 | Work, Energy & Power | 1 | 1 | 1 | - | 07 |
| 5 | Motion of System Particles & Rigid body | 1 | 1 | - | 1 | 09 |
| 6 | Gravitation | - | 1 | 1 | - | 06 |
| 7 | Properties of matter | - | 1 | 1 | 1 | 12 |
| 8 | Thermodynamics | 1 | - | 1 | - | 05 |
| 9 | Behaviour of Perfect gas & Kinetic theory of gases | 1 | - | 1 | - | 05 |
| 10 | Oscillation & waves | 1 | - | - | 1 | 07 |
| **Total Questions** | | **08** | **08** | **07** | **03** | **26** |
| **Total Marks** | | **08** | **16** | **28** | **18** | **70** |

## INSTRUCTIONS FOR PAPER SETTER

**Note:**

1. There will be one theory paper consisting of total 26 questions.
2. Question no.1 to 8 will be of 1 mark each.There will be 4 questions of the objective type such as yes/no,multiple choice questions, fill in the blanks.
3. Question no.9 to 16 will be of 2 marks each. There will be 3 numerical questions of 2 marks each.
4. Question no. 17 to 23 will be of 4 marks each. There will be two four marks questions of internal choice. Each of these questions will have one theory question & other part will be numerical from the same unit.These questions should not be lengthy.
5. Question No.24 to 26 will be 6 marks and their will be 100% internal choice in them. These questions must have two parts: part (a) will be of one mark and part (b) will be of 5 marks. Part (a) may cover any topic from same unit as of long 5 marks question of part (b).
6. Questions paper should cover all the syllabus.
7. No question or topic should be repeated in the question paper.
8. Questions in the paper can be asked only from mentioned PSEB syllabus. Questions from any topic which is not mentioned in the syllabus will be considered as out of syllabus question.
9. All 3 sets must be of equal standard and difficulty level questions.
10. At the end of each question, paper setter must write detailed distribution of marks of each sub-question.
11. Vague, many possible answer questions, confusing answer question etc type of question will not be asked in the paper. One mark questions, answer should be of one word or one line only.
12. Language used should be clearly understood & specific.
13. Time and length limit of paper should be kept in mind.
14. Time and length limit of paper should be kept in mind while setting the paper.

## SYLLABUS (THEORY)

**Unit I : Physical World and Measurement**

Physics-scope and excitement; nature of physical laws; Physics, technology and society.

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement, significant figures.

Dimensions of physical quantities,dimensional formula and dimensional equation dimensional analysis and its applications.

**Unit II : Kinematics**

Frame of reference. Motion in a straight line: Position-time graph, speed and velocity.

Uniform and non-uniform motion, average speed and instantaneous velocity.

Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion (graphical treatment).

Elementary concepts of differentiation and integration for describing motion, Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity.

Unit vector: Resolution of a vector in a plane - rectangular components. *Scalar and vector product of vectors.* Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

**Unit III : Laws of Motion**

Intuitive concept of force. Inertia. Newton's first law of motion; momentum and Newton's second law of motion; impulse: Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces. Static and kinetic friction, laws of friction. rolling friction, lubrication.

Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road. vehicle on banked road).

**Unit -IV: Work, Energy and Power**

Scalar product, Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power.

Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-Conservative forces, various forms of energy, motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

**Unit-V: Motion of System of Particles and Rigid Body**

Centre of mass of a two-particle system, momentum conversation and centre of mass motion. Centre of mass of a rigid body; linear momentum of system of particles, vectory product of two vectors, centre of mass of uniform rod. Angular velocity and its relation with linear velocity.

Moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration.

Values of moments of inertia for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications. Kinematics of rotational motions about a fixed axis, dynamics of rotational motions about a fixed axis, angular momentum in case of rotation about a fixed axis, rolling motion.

**Unit-VI: Gravitation**

Keplar's laws of planetary motion. The universal law of gravitation.

Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy; gravitational potential. Escape velocity, Orbital velocity of a satellite. Geo-stationary satellites. Energy of an orbiting satellite, Geo- stationary satellites and polar satellites, weigtht lessness.

**Unit-VII: Properties of Bulk Matter**

Elastic behaviour, of solids, Stress-strain relationship, Hooke's law, Young's modulus, determination of Young's modulus of the material of a wire, shear, bulk modulus shear, modulus of rigidity,applications of elastics behavious of materials,Poisson s-ratio; elastic energy.

Pressure due to a fluid column Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Critical velócity. Bernoulli's theorem and its applications.

Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise, Detergents and surface tension.

Heat, temperature, measurement of temperature, ideal gas equation and absolute temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion, specific heat Capacity: Cp, Cv-colorimetry; change of state-latent heat.

Heat transfer-conduction, convection radiation and thermal Conductivity, *Qualitative idea of Blackbody radiation,* Newton's law of cooling and Stefan's law, Wein's displacement law, Green House effect.

**Unit-VIII: Thermodynamics**

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and intemal energy. First law of thermodynamics. Specific heat capacity, thermodynamic state variables and equation of state, thermodynamic processes, Isothermal and adiabatic processes. Second law of thermodynamics: reversible and irreversible processes. Heat engines and refrigerators, Carnot engine.

**Unit-IX: Behaviour of Perfect Gas and Kinetic Theory**

Molecular nature of matter, Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of an ideal gases. Assumptions, concept of pressure. Kinetic energy and temperature;
rms, speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases, solids and water: concept of mean free path, Avogadro's number.

**Unit-X: Oscillations and Waves**

Periodic and oscillatory motions, Periodic motion - period, frequency, displacement as a function of time.Periodic functions.Simple harmonic motion (S.H.M) and its equation; þhase; oscillations of a spring-restoring force and force constant; energy in S.H.M.-kinetic and potential energies: some systems executing simple harmonic motion simple pendulum-derivation of expression for its time period: free, forced and damped oscillations (qualitative ideas only), resonance.

Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement-relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

**NOTE:-** TOPICS GIVEN BELOW ARE IN PRESCRIBED SYLLABUS OF P.S.E.B. BUT NOT MENTIONED IN BOOK SURSCRIBED BY PSEB. SO THESE TOPICS ARE TO BE DONE WITH STUDENTS AND PAPER WILL INCLUDD THESE TOPICS AND QUESTIONS FROM THESE TOPICS TOPICS ARE NOT CONSIDERD AS OUT OF SYLLABUS.

1. Motion in a vertical circle
2. Centre of mass of uniform rod
3. Poiwsson'-ratio; elastic energy
4. Terminal ve;ocity
5. Qualitative idea of Blackbody radiation,
6. Stefan'a law, Wein's displacement law, Green House effect.
7. Definition of temperature
8. Work done on compressing a gas
9. Avogadro's number.

## STRUCTURE OF PAPER (PRACTICAL)

| **Time : 3 hrs.** | **Total : 20 Marks** |
|---|---|
| Two experiment | 10 |
| Record of Activities | 2 |
| Viva on Activities | 3 |
| Record of Experiments | 2 |
| Viva of Experiments | 3 |
| **Total** | **20** |

## PRACTICAL SYLLABUS

**Experiments**

1. Use of Vernier Callipers
   (i) To measure diameter & volume and volume of a small spherical/cylindrical body.
   (ii) To measure the dimenscons of given rectangular body of known mass and hence to determine its density.
   (iii) To measure internal diameter and depth of a given beaker/ calorimeter and hence find its volume.
2. Use of screw gauge
   (i) to measure diameter & volume of a given wire,
   (ii) to measure thickness of a given sheet
   (ii) to measure volume of an irregular lamina
3. To determine radius of curvature of a given spherical surface by a spherometer.
4. To find the weight of a given body using parallelogram law of vectors addition.
5. Using a simple pendulum, plot L-T and L-$T^2$ graphs. Hence find the effective length of second's pendulum using appropriate graph.
6. To study the relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and a horizontal surface.
7. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination ($\theta$) by plotting graph between force and $\sin\theta$.
8. To determine the mass of two different objects using a beam balance.

**SECTION-B**

1. To determine young's modulus of a given wire by using searle's apparatus.
2. To find out the spring constant of a helical spring from its load-extension graph.

3. To find force constant and effective mass of a helical spring by plotting $T^2$ -m graph using method of oscillation.
4. To study the variation in volume (V) with pressure (P) for a sample of air at constant temp. by plotting graphs between P&V and between P & 1/V.
5. To determine the surface tension of water by capillary rise method.
6. To determine the coefficient of viscosity of a given liquid by measuring the terminal volume of spherical body.
7. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
8. To determine the specific heat capacity of a given (i) solid (ii) liquid by method of mixtures.
9. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer.

   {ii) To study the relation between the length of a given wire and tension for constant frequency using sonometer.
10. To find the speed of sound in air at room temperafure using a resonance tube by two-resonançe positions.

**Activities**

1. To make a paper scale of given least count, e.g. 0.2cm, 0.5 cm.
2. To determine mass of a given body using a metre scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in range of a jet of water with angle of projection.
6. To study the conservation of energy of a ball rolling down on inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.
8. To observe change of state and plot a cooling curve for molten wax.
9. To observe and explain the effect of heating on a bi-metallic strip.
10. To nóte the change in level of liquid in a container on heating and interpret the observations.
11. To study the effect of detergent on surface tension of water by observing capillary rise.
12. To stúdy the factors affecting the rate of loss of heat of a liquid.
13. To study the effect of load on depression of a suitably clamped metre scale loaded.

(i) at its end (ii) in the middle.

14. To determine the radius of gyration about the centre off mass of a metre scale used as a bar pendulum.
15. To demonstrate uniform motion in a straight line of a body in glycerine (any viscous liquid) in a glass plastic tube in a burette.
16. To show that a centripetal force is necessary for moving a body with a uniform speed along a circle and that magnitude of the force increases with angular speed using glass tube & slotted weights.
17. To show interconversion of potential & kinetic energy using Maxwell's wheel.
18. To show conservation of momentum using bipilar pendulums.
19. To show that moment of inertia of a rod changes with the change of positions of a pair of equal weights attached to the rod.
20. To show the rise of water in capillary tubes of different diameters with the help of glass sheet.